TRAINING SIBLINGS OF CHILDREN WITH AUTISM TO INSTRUCT PLAY: ACQUISITION, GENERALIZATION, AND INDIRECT EFFECTS

Domonique Y. Randall, B.A.

Thesis Prepared for the Degree of

MASTER OF SCIENCE

UNIVERSITY OF NORTH TEXAS

May, 2000

APPROVED:

Shahla Ala'i-Rosales, Major Professor
Jesus Rosales-Ruiz, Committee Member
Richard Smith, Committee Member
Sigrid Glenn, Chair of Department of Behavior Analysis
David Hartman, Dean of the School of Community Service
C. Neal Tate,Dean of the Robert B. Toulouse School of Graduate Studies

Randall, Domonique Y. Training Siblings of Children with Autism to Instruct Play: Acquisition, Generalization, and Indirect Effects. Master of Science, (Behavior Analysis), May 2000, 64 pp., 5 tables, 7 illustrations, references, 12 titles.

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ACKNOWLEDGMENTS

First, I would like to thank my major Professor, Dr. Shahla Alai-Rosales, who is my friend and mentor in the field of autism, for giving of her time and wisdom, to make this thesis possible. Second, I would like to thank the members of my committee, Dr. Jesus Rosales and Dr. Richard Smith, for greatly appreciated time and feedback. Third, thanks to the faculty, staff, and students of the North Texas Autism Project for valuable research meetings. Fourth, thanks to the support of two great friends and fellow graduate students, Kristina and Yuka. Fifthly, thanks to my wonderful husband for putting up with me through these busy first few years and for all the back-rubs after long hard days at school. Sixth, thanks to my parents who made me keep going and going and going to school! Finally, I would like to thank a very special child with autism, Andrew, for inspiring me to pursue my education in Behavior Analysis so that I can make a difference in the quality of life for many other children with autism.

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CHAPTER 1
INTRODUCTION

Training Siblings of Children with Autism to Instruct Play: Acquisition, Generalization, and Indirect Effects

Deficits in the quality and the quantity of social interaction are defining characteristics of autism (American Psychiatric Association, 1994). This includes deficits in peer play, imitation skills, and imaginative play skills (Stone & Lemanek, 1990). Various behavioral training procedures have successfully addressed these social deficits in children with autism (DeMeyer, Hingten, & Jackson, 1981; Dunlap & Robbins, 1991; Green, 1996; Lovaas, 1987; Maurice, Green, & Luce, 1996; Schreibman, 1988). Behavioral procedures have been implemented by a wide range of change agents such as parents (e.g., Alpert & Kaiser, 1992; Koegel, Shreibman, Britten, Burke, & O'Neil, 1982), peers (e.g., Peirce & Shreibman, 1995; Strain, Kerr, & Ragland, 1979) and siblings (e.g., Celiberti & Harris, 1993; Coe, Matson, Craigie, & Gossen, 1991).

While fewer in number, those investigations targeting typically developing siblings as the primary change agents indicated that they can be successful as teachers in many content areas (Cash & Evans, 1975; Clark, Cunningham, & Cunningham, 1989; Colletti & Harris, 1977; James & Egel, 1986; Schreibman, O'Neill, & Koegel, 1983). Researchers have described some potential characteristics of and made compelling arguments for further study of sibling interventions for children with disabilities. For example, James and Egel (1986), found that during baseline conditions, handicapped siblings displayed few initiations to their typically developing siblings. They did,

however, respond to initiations made by their typically developing siblings. Unfortunately, their typically developing siblings rarely initiated interactions. A direct prompting procedure was used to increase initiations by the typically developing siblings. Recent observational research suggests that siblings of children with autism do not interact frequently with their siblings and, in fact, may lack skills that could increase positive interactions during play (El-Ghouroury & Romanczyk, 1999). Including siblings in the treatment of the child with disabilities may also help the overall consistency of treatment implemented by family members. This, in turn, may result in increased positive interactions between family members (Miller & Cantwell, 1976). Sibling involvement may also be beneficial for the typically developing child. For example, siblings can learn coping skills, including how to respond to the behaviors of the child with disabilities (Weinrott, 1974).

Table 1 displays a description of studies investigating siblings as change agents for children with disabilities, including, the author and year, diagnosis and number of participants, dependent variables, intervention, general results, and generalization (assessments and demonstrations across settings, materials, people, and time) for each study. Overall, these studies suggest that siblings of children with disabilities have been able to learn a wide range of skills in order to teach their brothers and sisters with disabilities. Also, generalization was assessed and demonstrated to varying degrees across settings, materials, and time. Children with disabilities have also shown improvement in performance when siblings are the change agents. Two of these studies will be discussed in detail. These studies were selected because they focused on teaching

siblings techniques to increase interactions with their siblings with autism during play (Celiberti & Harris, 1993; Coe et al., 1991).

In the first study, Coe et al., (1991) taught siblings of children with dual diagnoses of autism and mental retardation to use behavioral skills (prompting and reinforcement procedures) to increase verbal and non-verbal play responses in play contexts (ball play, tinker toys, truck, jigsaw, coloring). The intervention was a training package including modeling, roleplay, and feedback. Results indicated increases in the use of prompting and reinforcement procedures by siblings following treatment, as well as in a one-month follow-up probe. No generalization assessments across materials, settings, or people were conducted in this study.

In the second study, Celiberti and Harris (1993) taught siblings of children with autism several skills, such as eliciting play (e.g., "Make the horse run.") and play related speech (e.g.,"Say neigh!"), praising (e.g., "That's great!") and prompting play behaviors (physical guidance to follow through with the elicitation of play). The intervention included modeling, roleplay, and feedback. The number of desired responses made by the child with autism was recorded. The results showed increases in the demonstration of the trained skills by siblings. The siblings also used these skills while playing with other non-trained materials and at 3-week, 6-week, and 16-week follow-up probes. Furthermore, for one sibling dyad, the sibling demonstrated the skills with an additional handicapped sibling during treatment as well as in the 16-week follow-up probe. Also, the number of desired responses by the children with autism increased above baseline levels and maintained at follow-up.

Previous findings showed that siblings of children with autism have learned behavioral skills to interact with their brothers and sisters with autism and have demonstrated generalization of those skills across time (Celiberti & Harris, 1993; Coe et al., 1991). Additionally, Celiberti and Harris (1993) demonstrated generalization of the skills to other stimuli (materials and an additional handicapped child). These findings are encouraging and supportive of typically developing siblings being included in the treatment of children with autism. Celiberti and Harris (1993) noted, however, limitations and made several recommendations for future research. Some of the recommended avenues of research include generalization of the skills to non-training settings, demonstrating functional relationships between the training package and resulting behavior changes in the child with autism, and measures of overall joint engagement.

Generalization of treatment effects is considered an important aspect of any intervention program (Stokes & Baer, 1977). These studies replicate and extend previous research by including additional stimulus generalization assessments (non-training setting), measures of response generalization (joint engagement), and observations of initiations and imitations of the child with autism. The purpose of the present research was to investigate the effects of a sibling training package on play and engagement between children with autism and their siblings. The training package was a replication of Celiberti and Harris (1993). Two experiments were conducted. The training package (modeling, roleplay, and feedback) was identical in both experiments. In the first experiment, measures included the sibling's application of behavioral procedures (instructing play, prompting, and praising), compliance by the child with autism, and

joint engagement. Experiment II extended the first study by also including stimulus generalization measures (additional materials and observation in a non-training setting) and additional response generalization measures (imitations and initiations of the child with autism). Furthermore, generalization was explicitly programmed and evaluated.

CHAPTER 2

METHOD

Experiment 1

Participants

The participants in this experiment were a 7-year-old typically developing child and her 5-year-old brother with autism. Informed consent was obtained from the parents (see Appendix A) and the sibling (See Appendix B). The female sibling was enrolled in regular education classes. The child with autism was diagnosed at age 4 years and 7 months. He was described as having severe speech delays, significant social impairment, and stereotyped patterns of behavior, interest, and activities. His parents were informed that he would need assistance in learning imitative skills. His vocabulary was limited to sounds seemed to have no meaning. He appeared to fear unfamiliar people and places. He had limited daily living skills. He attended special education classes for six hours a day, five days per week and received in home behavioral treatment two hours per day. His treatment program included training in functional communication, attending skills, identity matching, and oral motor imitation skills. At the time the study was conducted he had received six months of in-home training.

According to parental reports, the children rarely interacted with family members at home. When interactions were observed, they were typically inappropriate (e.g., child with autism spinning toys, screaming, crying) and very brief. The sibling reported that she disliked playing with her brother because he would not listen to her and that he did "weird things," such as waving and spinning toys.

The author, a graduate student in Behavior Analysis at the University of North Texas with four years of supervised experience teaching children with autism, conducted all sibling-training sessions.

Setting and materials

All sessions took place in the playroom of the participants' home. This room had toys, a bookshelf with books, a large desk, a small table and a video camera. Except for training toys, play materials were not available during sessions. Training toys included a Playskool Spin Around Carousel™ along with a tractor, farmer, pig, two sheep, two cows, a horse, a chicken, and a duck.

Dependent Measures

Data were collected on relevant behaviors of both the child with autism and his sibling. Additionally, data were collected on the joint engagement between the two children. Complete observation protocols for all measures are included in Appendix C.

Child Measures. The number of the child with autism's compliance to instructions given by the sibling was recorded. Compliance was defined as the initiation of a response by the child with autism to complete part or all of the sibling's play request within five seconds.

Sibling Measures. The dependent measures in this study included the sibling's performance in each of the following skill areas: instructing play, prompting, and praising.

The total number of sibling instructions was recorded as well as instructions meeting the training criteria. An instruction meeting criteria was scored if 1) the sibling obtained the attention of the child with autism in the form of direct eye contact or waited

until the child with autism made eye contact with the materials prior to her delivery of an instruction to play, and 2) the instruction was discrete and clear (not repeated multiple times, distinguishable from other phrases of conversation and spoken in a conversational tone). Prior to the introduction of a new skill, the sibling must have demonstrated the skills for instructing play for at least 80% of total trials across a minimum of two consecutive sessions.

Opportunities for sibling prompts and correctly delivered prompts were recorded. Each time the child with autism failed to respond or responded incorrectly to an instruction delivered, an opportunity for the sibling to prompt was scored. Correct prompting was scored if the sibling delivered a physical prompt in any instance where the child with autism made no response within five seconds or when the child with autism made an incorrect response following the sibling's instruction. The sibling must have demonstrated these skills for at least 80% of total opportunities and over two consecutive sessions to move to the next skill.

Opportunities for sibling praise and correct praise were recorded. Opportunities for praising were scored when the child with autism complied with an instruction from the sibling by emitting the appropriate behavior. Correct praising was scored when the sibling delivered some form of social praise or physical contact (e.g., hug, kiss, pat) contingent on correct responses made by the child with autism.

Joint Engagement. Joint engagement and interaction measures were scored using a 10s momentary time sample procedure. Interaction was scored when the children talked, touched or shared toys. Proximity was scored when the children were within at least one foot of each other physically. All sessions were videotaped and scored later.

Interobserver Agreement

Thirty-nine percent of total sessions in Experiment I were scored for interobserver agreement. The experimenter and a graduate level research assistant collected data. The research assistant served as the secondary observer. The assistant was given definitions of the behaviors to be recorded and viewed sample videos while the primary experimenter verbally identified behaviors to be recorded. The observers then independently viewed videotaped sessions and scored sibling data. Joint engagement data were collected by the observer and the experimenter simultaneously, but independently (observers sat at least 3 ft from each other). Interobserver agreement was calculated using total agreement (number of occurrences of the target behavior recorded by each observer was divided by the number of agreements plus disagreements and the quotient was multiplied by 100). Reliability checks were distributed across all conditions, with at least one reliability session per each condition. Interobserver agreement averaged 97% across the entire experiment. Tables 2 and 3 contain a breakdown of each dependent measure.

Experimental Design

A multiple baseline across skills was used to assess the effectiveness of training procedures on three targeted sets of skills (instructing play, prompting, and praising the child with autism).

Procedures

Baseline. Baseline consisted of three 10-minute sessions during which the siblings were observed following an instruction by the experimenter to play. The

experimenter delivered the statement "Play with (child with autism's name) with the Carousel."

Training. The independent variable was a training package for the typically developing sibling that included modeling, roleplay, and feedback. Modeling included a three-to-five minute demonstration of the target skill by the experimenter along with a verbal explanation of the procedures. For example, for "instructing play", the experimenter demonstrated how to gain eye contact from the child with autism, while the sibling watched. Following the modeling procedure, the experimenter and the sibling role-played the skill for at least five minutes. Then the sibling and the experimenter took turns obtaining eye contact from each other before instructing each other to play. For the remainder of the training session, the sibling practiced the skill with the child with autism while the experimenter delivered feedback and praise. For example, the sibling might practice obtaining eye contact from the child with autism while the experimenter gave feedback.

During training, skills were taught sequentially (instructing play, prompting and praising). After the sibling reached criteria for instructing play of at least 80% of trials across two consecutive sessions, training for prompting was introduced. After the sibling met criteria for prompting of at least 80% of trials across two consecutive sessions, training for praising was introduced.

Training Probes. Following a 15-minute training period, a 10-minute probe identical to the baseline session was conducted. The experimenter delivered the instruction to the children "Play with (child with autism) with the Carousel." All probes were videotaped. No feedback from the experimenter was delivered during the probes.

After the probe, general feedback such as “That was nice!” or “Thanks for playing.” was delivered to the children. Probes were conducted in the same manner throughout the study. Sessions were conducted one to two times weekly.

CHAPTER 3

RESULTS

Experiment I

Figure 1 displays the number of opportunities for the sibling to engage in the targeted skills (instructing play, prompting, and praising, respectively) and the number of occurrences of the targeted skills over consecutive 10-minute sessions. The top graph displays the number of sibling instructions to play (open circles) and the number of instructions that met the training criteria (closed circles). During baseline, the sibling did not instruct the child with autism to play. During training, the sibling's instructions to play increased immediately to 24 and 21 occurrences per session, with 86% and 92% of those instructions meeting the training criteria. During maintenance, the sibling's instructions to play averaged seven per session (range, 5-10) with 99% of instructions meeting the training criteria (range, 89-100). During follow-up, the sibling delivered five instructions and all of those instructions met the training criteria.

The middle graph displays the number of prompting opportunities (open circles) and the number of prompts delivered correctly by the sibling (closed circles). Zero opportunities for prompting occurred during the first three sessions of baseline, however, in the last two baseline sessions there were 24 and 21 prompting opportunities. The sibling did not prompt the child with autism despite many opportunities to prompt during the last two baseline sessions. During training, opportunities for prompting averaged about five opportunities per session (range, 3-9). The sibling prompted following 80%, 78%, and 83% of the opportunities in the first three sessions. During the last three sessions of training, the sibling prompted following every opportunity. During

maintenance, prompting opportunities averaged five per session (range, 4-7) and the sibling delivered prompts following 98% of opportunities. During follow-up, the sibling had five opportunities to prompt and she prompted after all of the opportunities.

The bottom graph displays the number of opportunities to praise (open circles) and the number of correct praise deliveries by the sibling (closed circles). During baseline, exactly half of the sessions had at least one opportunity for the sibling to deliver praise (range, 0-2). The sibling did not praise the child with autism during baseline. During training, the sibling had an average of one opportunity per session (range, 0-3), and the sibling delivered praise after all of the opportunities. During maintenance, the sibling had one and three opportunities to deliver praise. She delivered praise after 100% of opportunities. During follow-up, the sibling delivered praise following the only opportunity to praise.

Figure 2 displays the number of 10s intervals the siblings were engaged in interaction, physical proximity over consecutive 10-minute sessions. The closed circles represent interaction and triangles represent proximity. The arrows indicate the onset of a training phase. During baseline, the siblings interacted for only 1/60 intervals (range, 0-1), and were in proximity for an average of 26/60 (range, 20-36) intervals per session. During the probes sessions for instructing play, the siblings interacted 40/60 and 28/60 intervals, while their proximity increased to 58/60 and 46/60 intervals.

During the five probes for prompt training, the siblings interacted an average of 37/60 (range, 24-42) intervals. They were in proximity for an average of 52/60 (range, 40-60) intervals. During seven probes for praise training, the siblings interacted during an average of 42/60 (range, 32-53) intervals per session, and they were in proximity for

an average of 55/60 (range, 50-60) intervals per session. During follow-up, the siblings interacted for 53/60 intervals, and were in the proximity for 57/60 intervals per session.

CHAPTER 4

DISCUSSION

Experiment I

The sibling showed rapid mastery of all target skills as well as maintenance of these skills during follow-up sessions. The results of this study are consistent with other studies documenting that siblings of children with autism can learn behavioral training skills and use them during play (Celiberti & Harris, 1993; Coe et al., 1991). The sibling met the requirements of the training criteria for all skills within the first few training sessions of each phase. The number of opportunities for the sibling to demonstrate skills varied across sessions. For example, she delivered 25 instructions to play in her first training session, and only five instructions to play when the next skill (prompting) was introduced. This did not, however, affect her demonstration of skills and all of her instructions met the training criteria.

There was no minimum or maximum number of instructions required of the sibling. The use of number instead of percentage of intervals in this study avoided inflation and deflation and allowed observation of the variability of the sibling's demonstrated skills. The number of opportunities for the sibling to demonstrate her skills was dependent upon the sibling's instructions to play and the child's compliance to those instructions. For example, each time the sibling instructed the child with autism to play, she had the opportunity to use a discrete and clear instruction, wait for direct eye contact from the child, or wait until the child looked at materials before she delivered an instruction. Also, if the child with autism did not respond to her instruction or responded incorrectly, she had the opportunity to physically prompt the child to respond. Lastly, if

the child with autism made a correct response to her instruction, she had the opportunity to praise the child. Although the sibling had limited opportunities to praise the child with autism in this experiment, she praised after every opportunity.

Previous research reported that while siblings played parallel to each other the siblings did not engage in interactive play during baseline (Celiberti & Harris, 1993). The current study contained measures on play engagement between siblings. During baseline, the children remained in close proximity, but interactions rarely occurred. Proximity and interaction increased significantly above baseline levels and maintained throughout treatment and in a six-week follow-up probe. In addition, behaviors other than those taught to the sibling were observed to occur. Anecdotal evidence indicated that the siblings engaged in more "rough-and-tumble" play, exchanged toys, and expanded upon each other's initiations.

Although the results of this study indicated that the results of the intervention sustained over time, three important areas were not addressed in this study. First, no generalization data were collected in non-training settings. Second, no generalization measures were included across materials. Third, no dependent measures related specifically to the child with autism's social skills were included. A second experiment was conducted to replicate and expand Experiment I by including additional stimulus (non-trained materials and a non-training setting) and response generalization (initiations and imitation by the child) measures. Specifically, the purpose of Experiment II was to assess the effects of the training package in a second sibling dyad and to assess and program generalization.

CHAPTER 5

METHOD

EXPERIMENT II

Participants

The participants in this study were a six-year-old typically developing child and her four-year-old brother diagnosed with autism. Informed consent was obtained from the parents (see Appendix A) and the sibling (See Appendix B). The female sibling was enrolled in regular education classes. The child with autism was diagnosed at age 34 months. He was described as having no functional communication skills, few imitation skills, and only brief eye contact. The child with autism did not attend school at the time of the study; however, he received four to six hours of in-home behavioral treatment daily. The treatment plan for the child with autism included imitation, direction following, receptive and expressive labeling, verbal imitation, and functional communication training. He had been receiving treatment for 11 months at the time of this study. In May of 1998, he was described as significantly self-directed, with a short attention span, reduced interests, and impaired comprehension skills. He only followed very simple requests. He had diminished interactions with others around him and severe delays in verbal and nonverbal communication.

The children's mother reported that the children interacted occasionally at home but that the quality of interaction was poor and usually short in duration. For example, simple play interactions would be terminated when the sister attempted to play with her brother. Furthermore, the mother reported that the child with autism would occasionally bite, kick, or hit his sister.

Setting and Materials

The experiment was conducted at a clinical center at the North Texas Autism Project, located at the University of North Texas. Sessions took place in a clinic room, containing a child size table, and an empty bookshelf used to hold the training toys. Materials used during this experiment included a Playskool Spin Around Carousel™ along with a tractor, a farmer, pig, two sheep, two cows, a horse, a chicken, and a duck, and a Fisher-Price Little People School™, and a Fisher-Price Little People Main Street™. The Fisher-Price Little People Main Street™ was used as the training and probe toy for all sessions. The Fisher-Price ™and the Playskool Spin Around Carousel™ were used to assess generalization of skills from the training toy to other toys.

Dependent Measures

Data were collected on the relevant behaviors of both the child with autism and the sibling. All dependent measures were identical to those in Experiment I except with the addition of measures on the child with autism and generalization measures (Appendix C contains the complete observational protocol).

Child Measures. Measures were the same as Experiment I with the addition of the child with autism's number of physical and verbal initiations to his sibling as well as physical and verbal imitations of his sibling.

Sibling Measures. Measures were identical to those in Experiment I.

Joint Engagement. Measures were identical to those in Experiment I.

Interobserver Agreement

Interobserver was calculated the same as in Experiment I. Thirty percent of sessions were scored for Interobserver agreement purposes. Reliability checks were distributed across all conditions, with at least one reliability session per each condition. Interobserver agreement averaged 95% across the entire experiment. Tables 4 and 5 contain a breakdown of each dependent measure.

Experimental Design

A multiple baseline across skills was used to assess the effectiveness of training procedures on the targeted skill areas (praising, instructing play, and prompting, respectively).

Procedures

Baseline. Baseline measures were taken with the training toy (Fisher-Price Little People Main Street™), in a non-training setting (the home of the children) and with additional generalization toys (Fisher-Price Little People School™, Playskool Spin Around Carousel™). Baseline with the training toy consisted of three 10-minute sessions during which the siblings were observed following an instruction to play by the experimenter. The experimenter delivered the statement "Play with (child with autism's name) with Main Street."

Baseline for the non-training setting (home of the children) included one 10-minute session during which the siblings were observed by the experimenter following an instruction to play together.

Baseline for the generalization toys (Fisher-Price Little People School™ and Playskool Spin Around Carousel™) consisted of one 10-minute probe for each of the toys

during which the siblings were observed following an instruction to play by the experimenter. The experimenter delivered the statement "Play with (child with autism's name) with the (Carousel, or School).

Training

The independent variable was the same training package used in Experiment I, in which the sibling was taught behavioral skills using modeling, roleplay, and feedback. The order of the skills trained was altered with praising taught first, then instructing play, and then prompting. Criteria and procedures for progressing across training areas were identical to Experiment I.

Training Probes. Probes were conducted the same as Experiment I.

Generalization Probes. Generalization probes were conducted with other toys (Playskool Spin Around Carousel™ and Fisher-Price Little People School™) in the clinic setting. The toys used to assess generalization were probed on the same day in a randomized order with a five-minute break between the probes. Following mastery of a skill area with the Fisher-Price Little People Main Street™, probes were conducted with non-trained materials to determine if the mastered skill generalized to novel toys. This 10-minute probe was otherwise identical to that of baseline sessions.

Throughout the study, several 10-minute videotaped generalization probes were conducted in the children's home. A graduate student other than the experimenter went to the home of the children to videotape them playing. Although, the children did not receive a formal instruction to play, they were informed that the observer was there to watch them play.

CHAPTER 6

RESULTS

Experiment II

Figure 3 displays the number of opportunities for the sibling of the child with autism to engage in the targeted skills (praising, instructing, prompting, respectively) and the number of occurrences of the targeted skills over consecutive 10-minute sessions. The top graph displays the sibling's number of praise opportunities (open circles) and the number of praise the sibling delivered following opportunities that met the training criteria (closed circles). During baseline, no opportunities to praise occurred. During training, opportunities to praise averaged two opportunities per session (range, 1-3) and, of those opportunities to praise, the sibling delivered praise after all opportunities. During maintenance, opportunities to praise increased to an average of three opportunities per session (range, 0-10), in which the sibling delivered praise following 98% of opportunities. During follow-up for praising, the sibling had two opportunities and she praised after both opportunities.

The middle graph displays the number of instructions to play (open circles) and instructions delivered by the sibling that met the training criteria (closed circles). During baseline, the sibling did not instruct the child with autism to play during the first three sessions, however, total instructions to play averaged seven per session (range, 3-12) in the last four sessions of baseline with 19% of total instructions meeting the training criteria. During training, there was an increase in total instructions to play by the sibling with an average of seven per session (range, 2-15). 100% of total instructions met the training criteria during the first six sessions, and 93% of instructions met criterion during

the last session. During maintenance, the sibling delivered an average of six instructions per session (range, 3-6), and all of those instructions met the training criteria. During the six-week follow-up session, the sibling delivered four instructions to play all of which met the training criteria.

The bottom graph displays the number of opportunities for the sibling to prompt the child with autism (open circles) and those prompts delivered that met criteria (closed circles). During baseline, the sibling had an average of four opportunities per session to prompt the child with autism (range, 0-12). The sibling prompted after 27% of opportunities. During training, there were four and one opportunities for the sibling to prompt and the sibling prompted following 80% and 100% of opportunities. During maintenance, the sibling had an average of two opportunities to prompt per session and she delivered prompts after 80% of opportunities. During follow-up, the sibling prompted the child with autism following the only two opportunities she had.

Figure 4 displays generalization probes conducted in the home setting which include the number of opportunities for the siblings to engage in the targeted skills and the number of occurrences of all targeted skills over consecutive 10-minute sessions. The top graph displays the number of sibling opportunities to praise the child with autism (open circles) and the number of praise delivered that met the training criteria (closed circles). During baseline, there were no opportunities for the sibling to deliver praise. During the probes conducted to assess the generalization of the skills for delivering praise, only one opportunity occurred for praising and the sibling delivered praise following that opportunity. During maintenance, there were no praise opportunities. When the experimenter gave the instruction to generalize, opportunities for praising

increased to two and six opportunities, and the sibling delivered praise following 100% of the opportunities. During the six-week follow-up probe, the sibling had three opportunities to praise the child with autism, and she delivered praise after all opportunities.

The middle graph displays the number of sibling instructions to play (open circles) and those instructions that met the training criteria (closed circles). During baseline, the sibling delivered only one instruction to play and that instruction did not meet the training criteria. During those probes assessing generalization of instructions to play, there were no instructions to play delivered by the sibling. After the experimenter delivered the instruction to generalize, the sibling delivered three and nine instructions to play with all of those instructions at 100% criteria. The six-week follow-up session had 14 instructions to play, and 86% of those instructions met criteria.

The bottom portion of figure 4 displays the number of opportunities for prompts (open circles) and the number of prompts delivered that met criteria (closed circles). Zero opportunities for prompting occurred through out both baseline and training. However, after the instruction to generalize, the sibling had one and three opportunities to prompt and she prompted after all opportunities. During the six-week follow-up session, the sibling had 11 opportunities for prompting, and the sibling prompted following 64% of the opportunities.

Figure 5 displays the number of opportunities and the number of occurrences of all targeted skills (praising, instructing play, and prompting) for other materials over 10-minute observation sessions. The open circles represent teaching opportunities for the Playskool Spin Around Carousel™ and the closed circles represent correct teaching

episodes for the Playskool Spin Around Carousel™. The open squares represent teaching opportunities for the Fisher-Price Little People School™ and the closed squares represent correct teaching episodes for the Fisher-Price Little People School™.

The top graph displays the number of opportunities for the sibling to deliver praise (open circles and squares) and the praise delivered by the sibling that met the training criteria (closed circles and squares). During baseline, there were no opportunities for delivering praise for either generalization toy. After criteria for praise was met in the clinic setting, a probe was taken with both the Playskool Spin Around Carousel™ and the Fisher-Price Little People School™. The sibling had nine opportunities to praise the child with autism while playing with the Playskool Spin Around ™, and of those nine opportunities she praised following all opportunities. There were no opportunities to praise the child with autism while playing with the Fisher-Price Little People School™. During maintenance, the sibling had three and one opportunities to praise while playing with the Playskool Spin Around Carousel™, for which she praised following 100% of opportunities. While playing with the Fisher-Price Little People School™, the sibling had six and two opportunities per session, for which she praised 100%. During the six-week follow-up, the sibling had four opportunities to prompt while playing with the Playskool Spin Around Carousel™ and five opportunities while playing with the Fisher-Price Little People School™. The siblings praised during 75% of opportunities while playing with the Playskool Spin Around Carousel™ and 60% while playing with the Fisher-Price Little People School™.

The middle graph displays the number of instructions to play (open and closed circles) and those instructions that met the training criteria (closed circles and squares). During baseline, the sibling instructed play zero and 14 times, while playing with the Playskool Spin Around Carousel™, of those instructions, only one instruction met criteria. During baseline, for the Fisher-Price Little People School™, the sibling did not deliver any instructions to play. During those probes that corresponded with instruction to play training, the sibling instructed play seven times while playing with the Playskool Spin Around Carousel™. All seven instructions met criteria. For the Playskool Spin Around Carousel™, the sibling instructed play 12 times and all instructions met criteria. Maintenance for instructing play included two instructions at 100% criteria while playing with the Playskool Spin Around Carousel™, and four sibling instructions at 100% criteria while playing with the Fisher-Price Little People School™.

During the six-week follow-up, the sibling instructed the child with autism to play seven times with both the Playskool Spin Around Carousel™ and the Fisher-Price Little People ™, in which 100% of instructions met the training criteria.

The bottom graph displays the number of praising opportunities for the sibling and the number of praise delivered by the sibling. During baseline, the sibling had and average of four opportunities (range, 0-9) for praising while playing with the Playskool Spin Around Carousel™ and two opportunities (range, 0-6) per session for praising while playing with the Fisher-Price Little People ™. The sibling did not praise after any of the opportunities for either toy during baseline. During the probe conducted simultaneously as prompt training, the sibling had zero opportunities to prompt while playing with the

Playskool Spin Around Carousel™, and two opportunities to praise with the Fisher-Price Little People ™. The sibling praised following 50% of opportunities. During the six-week follow-up sessions for prompting, the sibling had two opportunities to prompt the child with autism with the Playskool Spin Around Carousel™ and four opportunities with the Fisher-Price Little People ™, of those opportunities, she delivered prompts following all opportunities.

Figure 6 displays the number of 10s intervals the siblings were engaged in interaction and physical proximity over 10-minute sessions during the generalization probes in the clinic, home setting, and with other materials. The closed circles represent the children interacting with one another. Triangles represent that the siblings were within 1-foot physical proximity of each other. The arrows represent the onset of a training phase.

The top graph displays engagement in interaction, proximity of the siblings in the clinic setting with the Fisher-Price Little People Main Street™ toy. During baseline, the siblings interacted for an average of 7/60 intervals (range, 4-14), and they were in proximity for an average 25/60 intervals (range, 20-28). During the probes for praise training, the siblings interacted an average of 31/60 intervals per session (range, 15-45), and they were in proximity for an average of 39/60 intervals per session (range, 20-51). During the probes for instructing play, the siblings interacted for an average of 39/60 intervals per session (range, 21-47). They were in proximity for an average of 47/60 intervals per session (range, 29-58). During the probes for prompting, the siblings interacted an average 39/60 intervals per session (range, 19-49), and they were in proximity for an average of 54/60 intervals per session (range, 38-60). During the six-

week follow-up, the siblings interacted for 51/60 intervals and were in target physical proximity for 59/60 intervals.

The second graph displays the interaction, physical proximity between siblings with the Playskool Spin Around Carousel™ toy. During baseline, the siblings did not interact and they were only in proximity for 2/60 intervals. During the probe conducted to assess praise training, the siblings interacted 16/60 intervals and were in proximity for 23/60 intervals. During the probe conducted to assess instructing play training, the siblings interaction increased to 47/60 intervals and they were in proximity for 55/60 intervals. During the probe conducted to assess prompt training, the siblings interacted for 48/60 intervals and were in proximity was 58/60 intervals. During the six-week follow-up, the siblings interacted for 52/60 intervals and were in proximity for 57/60 intervals.

The third graph displays the siblings interaction and proximity while playing with the Fisher-Price Little People School™ toy. During baseline, the siblings did not interact but were in proximity for 19/60 intervals. During the probe conducted to assess praise training, the siblings interacted for 2/60 intervals and were in proximity for 38/60 intervals. During the probe conducted to assess instructing play training, the siblings interacted for 45/60 intervals and their proximity increased to 53/60 intervals. During the probe conducted to assess prompt training, the siblings interacted for 46/60 intervals and they were in proximity for 57/60 intervals. During the six-week follow-up, the siblings interacted for 48/60 intervals and played in proximity for 49/60 intervals.

The last graph displays the interaction and proximity of the siblings in their home. During baseline, the siblings engaged in interactions of the siblings in the home setting.

During baseline, the siblings interacted for 3/60 intervals and were in proximity for 6/60 intervals. During the probes conducted to assess generalization of praise training, the siblings interacted for an average of 3/60 intervals (range, 1-5) and were in proximity for an average of 3/60 intervals (range, 2-13). During the probes conducted to assess instructing play training, the siblings interacted for an average of 11/60 intervals (range, 3-18), and were in proximity for and average of 16/60 intervals (range, 5-26) per session. During probes conducted to assess prompt training, the siblings interacted for an average of 11/60 intervals per session (range, 9-13) and they were in proximity for an average of 29/60 intervals per session (range, 9-49). After the experimenter gave the instruction to generalize in the home setting, the siblings interacted for 31/60 and 27/60 intervals per session, while proximity was 34/60 and 43/60 intervals per session. During the six-week follow-up, the siblings interacted for 48/60 intervals and were in proximity for 49/60 intervals.

Figure 7 displays the number of the child with autism's initiations and imitations over consecutive 10-minute sessions. The top graph displays the number of the child with autism's initiations. During baseline, the child with autism made an average of two physical initiations to the sibling per session (range, 2-3), and an average of 1 verbal initiation per session (range, 1-3). During sibling training, the child with autism's physical initiations increased significantly above baseline levels and averaged nine per session (range, 0-25). During sibling training, the child with autism's verbal initiations averaged three per session (range, 0-16). During the six-week follow-up probe, the child made eight physical initiations and six verbal initiations to his sibling.

The bottom graph displays the number of child spontaneous imitations of his sibling's actions or vocalizations during play. During baseline, the child with autism made zero physical imitations per session, and an average of one verbal imitation per session (range, 0-1). During the sibling training, the child with autism averaged four verbal imitations per session (range, 0-12). The child with autism averaged less than one physical imitation per session during sibling training. He physically imitated his sibling in only two probes throughout sibling training. Session 12 had one physical imitation, and session 18 had two physical imitations. During the six-week follow-up probe, the child did not physically imitate his sibling. He did, however, verbally imitate three of his sibling's vocalizations.

CHAPTER 7

GENERAL DISCUSSION

Experiment II

Skill Mastery

Similar to the findings of Experiment I, the sibling demonstrated rapid mastery of the skills taught in training and sustained maintenance of skills in follow-up.
The sibling reached mastery criteria for prompting, praising, and instructing play within the first two sessions of training. The number of instructions delivered by the sibling in Experiment II was lower than the number of sibling instructions in Experiment I. With the introduction of the third skill, praising, there was a decrease in the number of instructions delivered and very few opportunities for the sibling to praise the child with autism, however, she was very successful at praising the child and the quality of instructions remained at the training criteria.

It should be noted that, in Experiment II, the child with autism in engaged in behaviors such as biting, hitting, and kicking the sibling. The parent anecdotally reported that the child was attempting to bite therapists, siblings and parents at home for a period of several weeks. It was reported that the sibling responded to the biting attempts by running and screaming. Although, the sibling reported several biting attempts at home, biting was only observed in two of the training probes. During session seven, six biting attempts occurred and eight biting attempts occurred during session eight. During sessions eight through ten, the experimenter worked with the sibling (modeling, roleplay, and feedback) on how to respond to biting during training. Similar to training included in previous studies, she was taught to ignore the biting and try to keep playing (e.g.,

Celiberti & Harris, 1993; Schreibman et al., 1983). After three sessions, the number of instructions increased dramatically as the sibling learned how to respond to biting and biting decreased. The sibling made the highest number of initiations to the child with autism after she learned how to work through the biting episodes.

To some degree a comparison between the results of Experiment I and of Experiment II was compromised due to the change in the introduction sequence of training skills. For example, during baseline in Experiment II, the sibling displayed some degree of instructions at criteria. Rather than introducing instructions as the first training target, praise training was introduced. The decision to begin with praise was primarily a result of anecdotal observations during Experiment I. Specifically, the experimenter was interested in providing feedback for the child with autism immediately and did not want the child with autism to be exposed to a condition with high demands in the absence of positive feedback (praise) from the sibling.

Generalization

Treatment gains beyond the training setting are important for any individual (Baer, Wolf, & Risley, 1968) and previous studies have demonstrated limited generalization beyond training conditions (Celiberti & Harris, 1993). The results of Experiment II indicated that the use of multiple exemplar training was not necessary for the demonstration of skills to non-trained toys during for this sibling dyad. The sibling demonstrated all of the skills with the Fisher-Price Little People School™ toy and two skills with the Playskool Spin Around Carousel™ toy. Also, during the six-week follow-up, the sibling demonstrated all of the skills with both toys.

Generalization probes were conducted in the home of the children (non-training setting). The experimenter was not present. An observer came to the home and videotaped the children playing. Of her own accord, the parent occasionally told the children to play. Generalization of the trained skills did not occur in the home until the experimenter was present and delivered the instruction to generalize. Follow-up observations indicated some deterioration in the generalization of skills. This study is the only study intervention study that included programming for generalization when it failed to occur.

The experimenter may have been a common stimulus in both this study and previous research demonstrating generalization. The common stimulus, the experimenter, was present during generalization probes and may have contributed to generalization by reducing the discriminability of the two conditions (Stokes & Baer, 1977). In the current study, generalization of skills to non-trained materials (including probes in the clinic and at home) was only demonstrated in the presence of the experimenter. It may have been useful for the experimenter to manipulate her presence, alone, and in absence of the instruction to generalize, during the home probes. On the other hand, mediated generalization (instruction to play) may have contributed to the generalization of skills. Further investigation is needed in this area. Depending on the results of future research, an argument might be made for involving the parents of the children in the training, as the common stimuli or as mediators of intervention techniques.

Joint Engagement

The findings in Experiment II were consistent with Experiment I in that the siblings were independently playing with little joint interaction for the majority of intervals for all baseline sessions. In fact, joint interaction (sharing, talking, touching) rarely occurred during baseline. The children, however, were in proximity for approximately half of the intervals during all baseline sessions. These findings were consistent with the anecdotal reports of previous studies that reported that siblings engaged in parallel play with few initiations (Celiberti & Harris, 1993).

The present study showed that after the implementation of the treatment package, the siblings interactions increased significantly above baseline levels and maintained throughout all phases of training and follow-up. They also played in proximity more throughout treatment sessions and in follow-up. The findings of Experiment II were consistent with Experiment I in that the discrete teaching intervention promoted more sharing, positive touching, talking, and "rough and tumble" type play.

Joint engagement measures were also included for the untrained setting and with the other materials. Joint engagement measures for other toys showed that, after training, the siblings interactions and proximity increased immediately and significantly above baseline levels. The probes for the home setting showed that proximity and interaction increased only slightly during praise and instructing play training. With the introduction of sibling prompt training, however, proximity increased significantly.

Child Measures

Experiment II included additional measures specific to the deficits found in children with autism (imitation of play and speech and initiations). Celiberti and Harris

(1993) suggested that it may not be adequate to only record the child's desired responses to the siblings instructions but that other dependent measures should be included on the behavior of the child with autism. For this reason, the number of imitations of speech and play and the number of physical and verbal initiations made to the sibling were included. These measures were only recorded for training sessions in the clinic. The results indicated that the child with autism made more physical initiations following treatment. Verbal initiations only improved above baseline levels with the introduction of the third training phase (prompting). The number of imitations made by the child with autism during play was also recorded. Results indicated that the child with autism made more verbal imitations of the sibling following treatment.

Directions for Future Research

The findings of this study add to the supporting literature for the use of typically developing siblings in the treatment of children with autism. Several areas warrant further investigation. First, although the child with autism benefits from this treatment in areas specific to the deficits of autism (e.g., social interactions, physical initiations, and verbal imitation during play), verbal initiations did not improve significantly as a result of the sibling-training package. Future investigations may need to investigate combined training (the child with autism as well as the sibling). Second, techniques to program generalization can be compared and manipulated. Programming common stimuli and mediated generalization appear to be promising avenues for future research. For example, the involvement of parents in the treatment (mediators or common stimuli in the environment) of children with autism may be an effective generalization technique. Third, the training package resulted in indirect non-trained desirable behaviors from the

children such as joint engagement (sharing, talking, touching, rough-and-tumble play). This suggests that the types of measures included can be expanded to include joint engagement measures between siblings. Overall, this study has indicated several areas of future investigation that provide promising advancements in the programming and assessment of generalization of treatment effects, and in the area of indirect treatment gains for both the typically developing sibling and the child with autism.

APPENDIX A

CONSENT FORM FOR CHILD WITH AUTISM

Dear Parents:

My name is Domonique Randall and I am a candidate for a Master of Science degree in Behavior Analysis from the University of North Texas. I am asking you to participate in a study, the results of which will be used in my Master's Thesis. Please read the following informed consent form.

Informed Consent Form

I will be conducting a research project designed to teach siblings of children with autism to use a variety of skills that will enhance play with their sibling. For example, these skills include delivering instructions clearly and audibly, redirecting inappropriate play, gaining eye contact, shared control, and praising compliance. This study will examine the effects of modeling, feedback and role-playing on the acquisition of these skills. I request permission for your children to participate. This study will take place in the NTAP clinic at the University of North Texas. This study consists of 1-3 weekly sessions including fifteen minutes of training and a ten-minute probe after training. All sessions will be videotaped. For research and educational purposes, videotapes may be viewed by the Department of Behavior Analysis faculty and students as well as groups at professional conferences. To preserve confidentiality only pseudonyms will be used during any presentations. Depending on the number of sessions your children attend weekly, your children's involvement in this project could be as little as 12 weeks or as many as 30 weeks. Subjects may withdraw at anytime without penalty, prejudice, or loss of benefits. At the conclusion of this study a summary of the results will be made

available to parents. Should you have any questions or desire further information, please call me at 972-315-6500. Thank you in advance for your cooperation and support.

Sincerely,

Domonique Randall

THIS PROJECT HAS BEEN REVIEWED BY THE UNIVERSITY OF NORTH TEXAS COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (PHONE: 940-565-3940).

I, _____agree to allow my children _____&_____ to participate in this study to examine the effects of modeling, role-pay and feedback on the acquisition of skills in sibling dyads as well as generalization of these skills to an unstructured setting. This will benefit society by helping researchers to better understand acquisition and generalization of these skills. I understand that my participation in this study will not exceed 1 year. I give permission for the data obtained from my children's participation in this study to be used for educational purposes (journals and presentations). I understand that session will take place in the NTAP clinic at the University of North Texas. I have been informed of the benefits and risks of this study.

Date_____ Signature_____

Parent/Guardian's signature

APPENDIX B

ASSENT FORM FOR SIBLING OF CHILD WITH AUTISM

Dear sibling,

Hi. My name is Domonique Randall and I am a student at the University of North Texas. I want to ask you to participate in a study which will help me get my degree in Behavior Analysis and will help other people help kids like your brother (or sister).

Child Assent Form

I will be doing a study that will help you use special skills when you play with your brother (or sister) with autism. For example, I will help you learn to get your brother's (or sister's) attention before you ask them to play. Also, I will help you learn to help your brother (or sister) complete a play action. Finally, I will help you to praise your brother (or sister) when they do a great job. We will work together on several skills that will hopefully help you to make playing with your brother (or sister) easier and more fun. This study will take place in the NTAP clinic. You will get to come to the clinic each week. I will videotape sessions of you and your brother (or sister) playing together each time you come to the clinic. Other students and teachers may watch the videos of you and your brother (or sister) playing. This will help teachers and students learn how to better help siblings like you and your brother (or sister) play together. I will not tell the other students or teachers your names. We might be playing and working together for twelve to thirty weeks. You may stop coming to the clinic to see me if you do not want to keep participating in this study.

APPENDIX C

OBSERVATIONAL CODE/ DATA SHEETS

DEFINITIONS AND CODES

SIBLING CATEGORIES

Instructs play (Pl)- sibling delivers a verbal play related instruction with or without a model that requires the physical manipulation of one or more toys by the child with autism. Examples:

1. Sibling puts horse down slide while saying," Do this."
2. Sibling marches sheep around while saying, "Now you do it."
3. Sibling puts the girl on the swing and says

"Make her swing high."

Eye contact (Ey)-the sibling waits for direct eye contact from the child with autism, the children are facing each other and looking into each other's eyes.

Eye contact Material (Eym)- the sibling waits for the child with autism to look at the play materials before instructing or providing the play model, or the sibling holds up the materials in front of the child's face before instructing or demonstrating a play model.

Verbal praise (Vb)-the sibling verbally praises within 3 seconds of the performed play action by the child with autism.

Examples:

1. After the child with autism makes the cow run, the sibling says "Great! You made the cow run!"
2. The child with autism complies with an instruction and puts a person in the car, and the sibling says "Wow! You did it!"

Physical contact (Phys)- the sibling physically touches the child with autism within three seconds of a performed action by the child with autism (e.g. a pat on the head, a hug, a kiss).

Descriptive praise (Ds)- the sibling delivers verbal praise within 3 seconds of the performed action by the child with autism that is descriptive of the action performed.

Example:

1. The child with autism performs the desired action such as making the car drive fast. The sibling says "Great! Driving the car."

Physical prompt (PP)- the sibling physically guides the child with autism through the complete instruction.

Example: the sibling physically takes the child with autism's hand and moves his hand through the desired play action.

5 seconds (5s)- the sibling praises verbally, physically, or descriptively within 5 seconds of the child performing part or all of the play action.

<u>CHILD CATEGORIES</u>

Compliance (Comp)- the child with autism makes a physical effort to complete part or all of a play action instructed by the sibling within 5 seconds.

Non –compliance (NonComp)- the child does not physically respond to the instruction of the sibling within 5 seconds or makes an incorrect response by manipulating the toy(s) in a different manner than was demonstrated by the sibling.

Imitates sibling- the child with autism imitates any physical or verbal whole or partial action of the sibling without being instructed to do so.

Example: The sibling says "Neigh, I am a horse." The child says "Neigh"

Example: The sibling claps her hands while playing. The child claps his hands.

Physically initiates to sibling-the child with physically gives or takes a toy from the sibling, touches the sibling (e.g. pat, hug, kiss), follows the sibling physically around the room.

Verbally initiates to sibling-verbally requests, comments or protests to the sibling, or makes a verbal sound at the sibling (e.g. the child looks at the sibling and says "car" when they are playing with a car).

JOINT ENGAGEMENT

Proximity (P)- siblings are within approximately 1-ft of each other with any body parts.

Interaction (I)- siblings are interacting verbally or touching physically including reaching, imitation, touching the same material while any of the above, throwing toys to each other, giving toys to each other, taking toys from each other, demonstration of play to be desired, compliance of a demonstration.

Date_____Observer_____

Sibling datasheet Session_____ Time_____to _____

1	**Instructs**	**Prompts**	**Praises**
Sibling	Pl Ey Eym	PP 5s	3s Vb Ds Phys
Child	Comp NonComp		

2	**Instructs**	**Prompts**	**Praises**
Sibling	Pl Ey Eym	PP 5s	3s Vb Ds Phys
Child	Comp NonComp		

3	**Instructs**	**Prompts**	**Praises**
Sibling	Pl Ey Eym	PP 5s	3s Vb Ds Phys
Child	Comp NonComp		

4	**Instructs**	**Prompts**	**Praises**
Sibling	Pl Ey Eym	PP 5s	3s Vb Ds Phys
Child	Comp NonComp		

5	**Instructs**	**Prompts**	**Praises**
Sibling	Pl Ey Eym	PP 5s	3s Vb Ds Phys
Child	Comp NonComp		

6	**Instructs**	**Prompts**	**Praises**
Sibling	Pl Ey Eym	PP 5s	3s Vb Ds Phys
Child	Comp NonComp		

7	**Instructs**	**Prompts**	**Praises**
Sibling	Pl Ey Eym	PP 5s	3s Vb Ds Phys
Child	Comp NonComp		

Child datasheet

Date of session_____
Session_____ Time_____to _____

Initiates:

p p p p p p p p p p v v v v v v v v v v
p p p p p p p p p p v v v v v v v v v v
p p p p p p p p p p v v v v v v v v v v p=_____
p p p p p p p p p p v v v v v v v v v v v=_____
p p p p p p p p p p v v v v v v v v v v

Imitates w/o Instruction

p p p p p p p p p p v v v v v v v v v v
p p p p p p p p p p v v v v v v v v v v p=_____
p p p p p p p p p p v v v v v v v v v v v=_____
p p p p p p p p p p v v v v v v v v v v
p p p p p p p p p p v v v v v v v v v v

Hitting:_____
Biting:_____
Kicking:_____

Date of session_____
Session_____ Time_____to _____

Initiates:

p p p p p p p p p p v v v v v v v v v v
p p p p p p p p p p v v v v v v v v v v
p p p p p p p p p p v v v v v v v v v v p=_____
p p p p p p p p p p v v v v v v v v v v v=_____
p p p p p p p p p p v v v v v v v v v v

Imitates w/o Instruction

p p p p p p p p p p v v v v v v v v v v
p p p p p p p p p p v v v v v v v v v v p=_____
p p p p p p p p p p v v v v v v v v v v v=_____
p p p p p p p p p p v v v v v v v v v v
p p p p p p p p p p v v v v v v v v v v

Joint Engagement Datasheet

Date_____ Time_____to_____
Observer_____Session_____

1	S P I	S P I	S P I	S P I	S P I	S P I	
2	S P I	S P I	S P I	S P I	S P I	S P I	
3	S P I	S P I	S P I	S P I	S P I	S P I	
4	S P I	S P I	S P I	S P I	S P I	S P I	
5	S P I	S P I	S P I	S P I	S P I	S P I	
6	S P I	S P I	S P I	S P I	S P I	S P I	
7	S P I	S P I	S P I	S P I	S P I	S P I	
8	S P I	S P I	S P I	S P I	S P I	S P I	
9	S P I	S P I	S P I	S P I	S P I	S P I	
10	S P I	S P I	S P I	S P I	S P I	S P I	
	S= P= I=	S= P= I=	S= P= I=	S= P= I=	S= P= I=	S= P= I=	

APPENDIX D

TABLES

Table 1. Siblings as change agents for disabled children.

Author/ Year	Participants	Dependent Variables	Intervention	Results	Generalization
Cash & Evans (1975)	3 siblings 3 infants with MR	**Sibling**- prompting, reinforcement, and calling attention **Child**- poker chips in a box	**Sibling-** video modeling **Child**- sibling reinforcement	**Sibling-** use of skills increased **Child**- correct responding increased	**Material**: n/a **Setting**: demonstrated **Time**: 6-wk Demonstrated
Colleti & Harris (1977)	3 siblings, 1 child with autism, 1 child neurologically impaired	**Sibling**- delivery of reinforcement **Child**- frequency of bead stringing, out of seat,	**Sibling**- prompts by experimenter **Child**- sibling reinforcement	**Sibling**-modified disabled siblings behavior **Child-** increased desired behaviors	**Material:** n/a **Setting: n/a** **Time:** 5-wk demonstrated
Schreibman, O'Neill, & Koegel (1983)	3 siblings and 3 children with autism	**Sibling**-shaping, reinforcement, extinction, chaining, prompting **Child**- correct responses	**Sibling**-Video, modeling, discussion, & feedback **Child**-sibling praise	**Sibling**-Increased % of intervals using skills **Child**-improved responding	**Material:** n/a **Setting:** demonstrated **Time**: n/a
James & Egel (1986)	3 siblings, and 1 child with MR, 2 children with Cerebral Palsy	**Sibling & Child-** reciprocal interactions (sharing, motor play, verbal)	**Sibling**-prompting, modeling, & feedback **Child**-social initiation training	**Sibling &** **Child**- increased % of intervals with reciprocal interactions	**Material:** n/a **Setting:** n/a **Time:** 6 mo. demonstrated **Peers**: demonstrated * stimulus control
Clark, Cunningham, & Cunningham (1989)	3 siblings and 3 children with autism	**Sibling**-attends & signs to child **Child**-signs	**Sibling**-Group solving, role-play, feedback, reinforcement **Child**-sibling attention	**Sibling**-increased % of intervals attends and signs **Child**-in-creased signs	**Material:** n/a **Setting: n/a** **Time:** **3** & 6 mo. demonstrated
Coe, Matson, Craigie, & Gossen (1991)	2 siblings and 2 children with MR & autism	**Sibling**-delivers prompts and reinforcement **Child**-nonverbal and verbal play	**Sibling**-modeling, role-play, & feedback **Child**-sibling prompts and reinforcement	**Sibling**-increased % of intervals prompts and praise **Child**- increased use of nonverbal and verbal	**Material:** n/a **Setting:** n/a **Time:** 1 mo. Demonstrated
Celiberti & Harris (1993)	3 siblings and 3 children with autism	**Sibling**-elicits play and play speech, prompts, praises **Child**-correct responses	**Sibling**-modeling, role-play, & feedback **Child**-sibling praise	**Sibling**-increased % of intervals use of skills **Child**-improved responding	**Material:** demonstrated **Setting:** n/a **Time:** 3,6,16-wk demonstrated

Table 2. Interobserver Agreement Experiment 1

Measure	Baseline	Intervention						Range %	Mean %
	3	5	6	7	11	13	16		
Opportunities To instruct play	100%	100%	83%	100%	100%	100%	100%	83-100	98%
Instructed play that met Criteria	100%	100%	100%	100%	100%	100%	100%	n.a.	100%
Opportunities to deliver Prompt	100%	100%	83%	100%	100%	100%	100%	83-100	98%
Delivered prompt that met criteria	100%	100%	100%	100%	100%	100%	100%	n.a.	100%
Opportunities to deliver praise	100%	100%	100%	100%	100%	100%	100%	n.a.	100%
Delivered praise that met Criteria	100%	100%	100%	100%	100%	100%	100%	n.a.	100%
Total	100%	100%	95%	100%	100%	100%	100%		99%

Table 3. Interobserver Agreement for Joint Engagement Data Experiment 1

Measure	Baseline	Intervention						Range %	Mean %
	1	1	2	3	4	5	6		
Proximity	91%	93%	100%	100%	100%	100%	89%	89-100	96%
Interaction	100%	96%	90%	83%	96%	92%	89%	83-100	92%

Table 4. Interobserver Agreement Experiment 2

Measure	Baseline	Intervention					Range %	Mean %
	2	5	6	10	12	15		
Opportunities to instruct play	100%	100%	88%	100%	100%	83%	83-100	95%
Instructed play that met criteria	100%	100%	100%	100%	93%	100%	93-100	99%
Opportunities to deliver prompt	100%	100%	100%	100%	90%	83%	83-100	96%
Delivered prompt that met criteria	100%	100%	100%	100%	50%	100%	50-100	92%
Opportunities to deliver praise	100%	100%	100%	100%	80%	100%	80-100	96%
Delivered praise that met criteria	100%	100%	100%	100%	80%	100%	80-100	96%
Total	100%	100%	98%	100%	82%	95%		96%

Table 5. Interobserver Agreement for Joint Engagement Data Experiment 2

Measure	Baseline	Intervention					Range %	Mean %
	1	1	2	3	4	5		
Proximity	93%	80%	98%	100%	100%	96%	93-100	95%
Interaction	80%	98%	91%	100%	98%	96%	80-100	94%

APPENDIX E

FIGURES

Figure 1. Experiment I. Sibling play opportunities and criteria met correctly for all targeted skills.

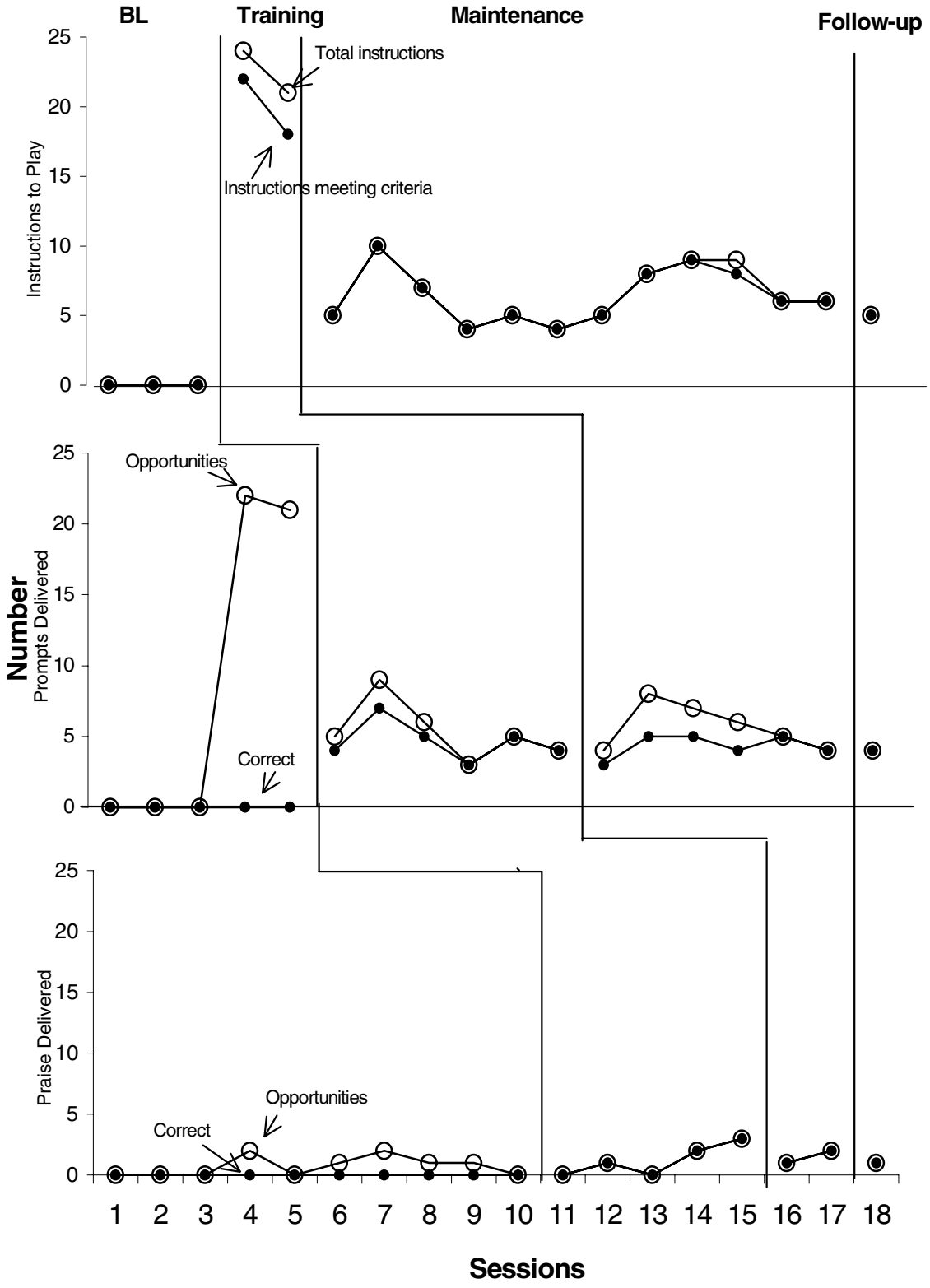


Figure 2. Experiment I. Interaction and physical proximity between siblings

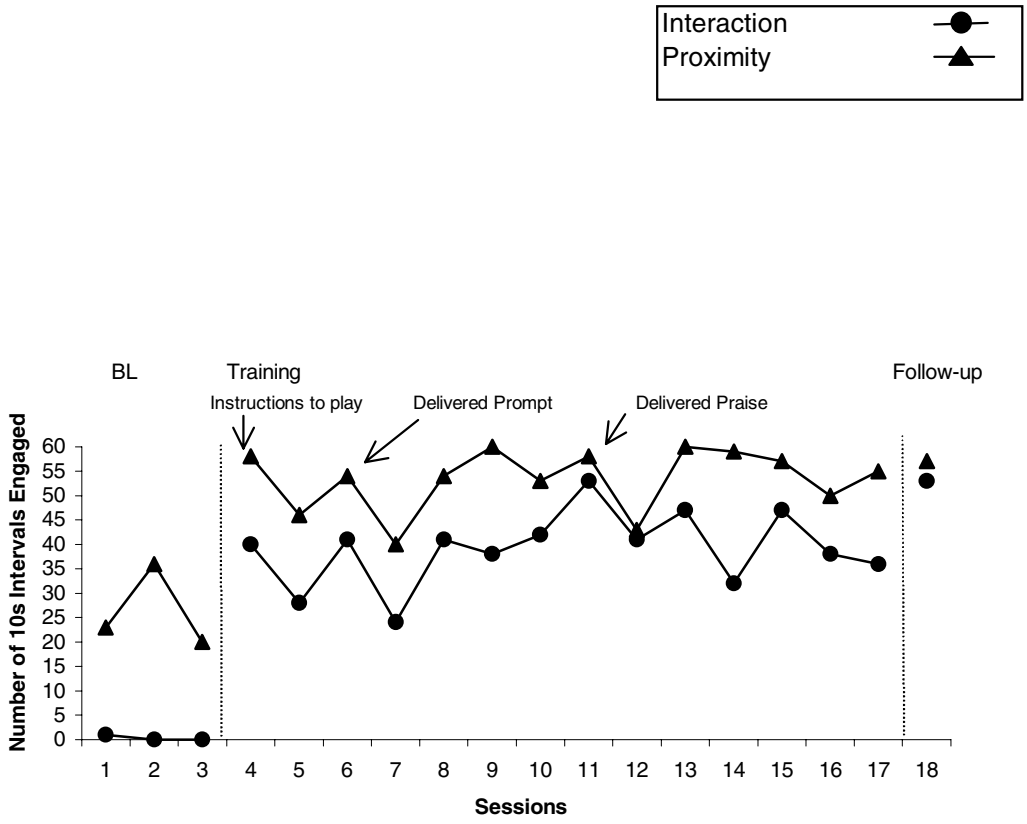


Figure 3. Experiment II. Sibling play opportunities and criteria met correctly for all targeted skills.

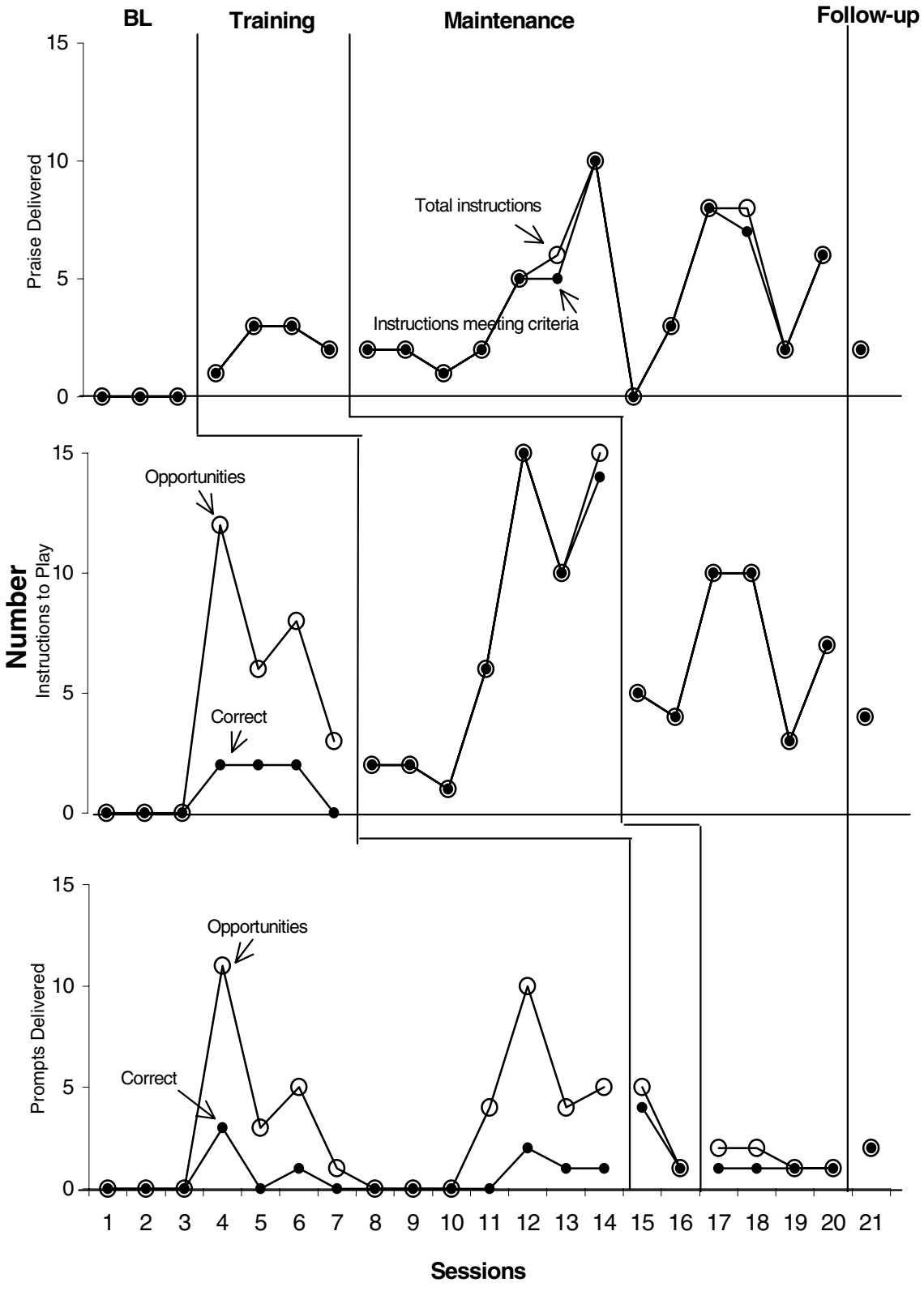


Figure 4. Experiment II. Generalization probes for home setting.

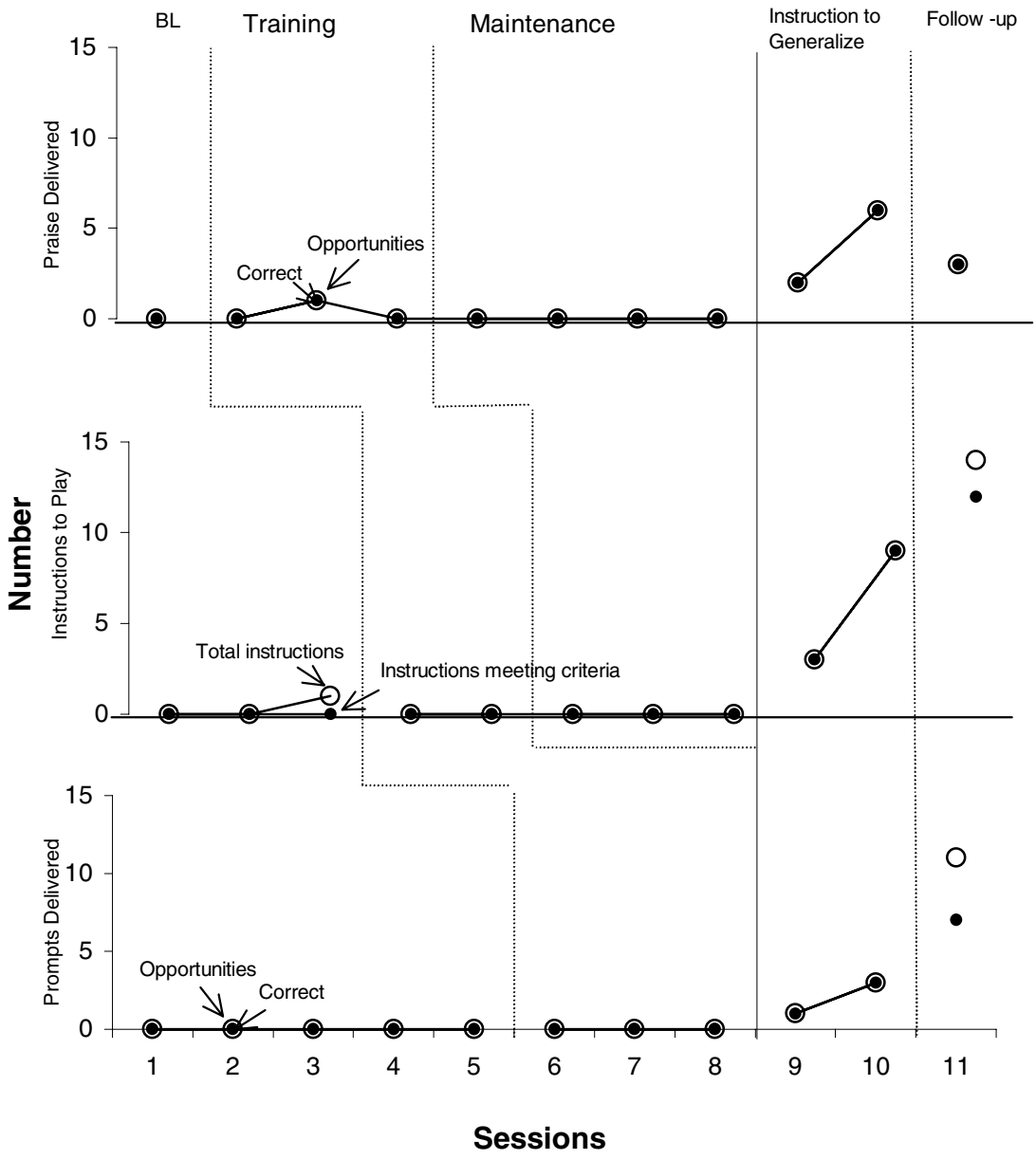


Figure 5. Experiment II. Generalization probes for non-trained toys.

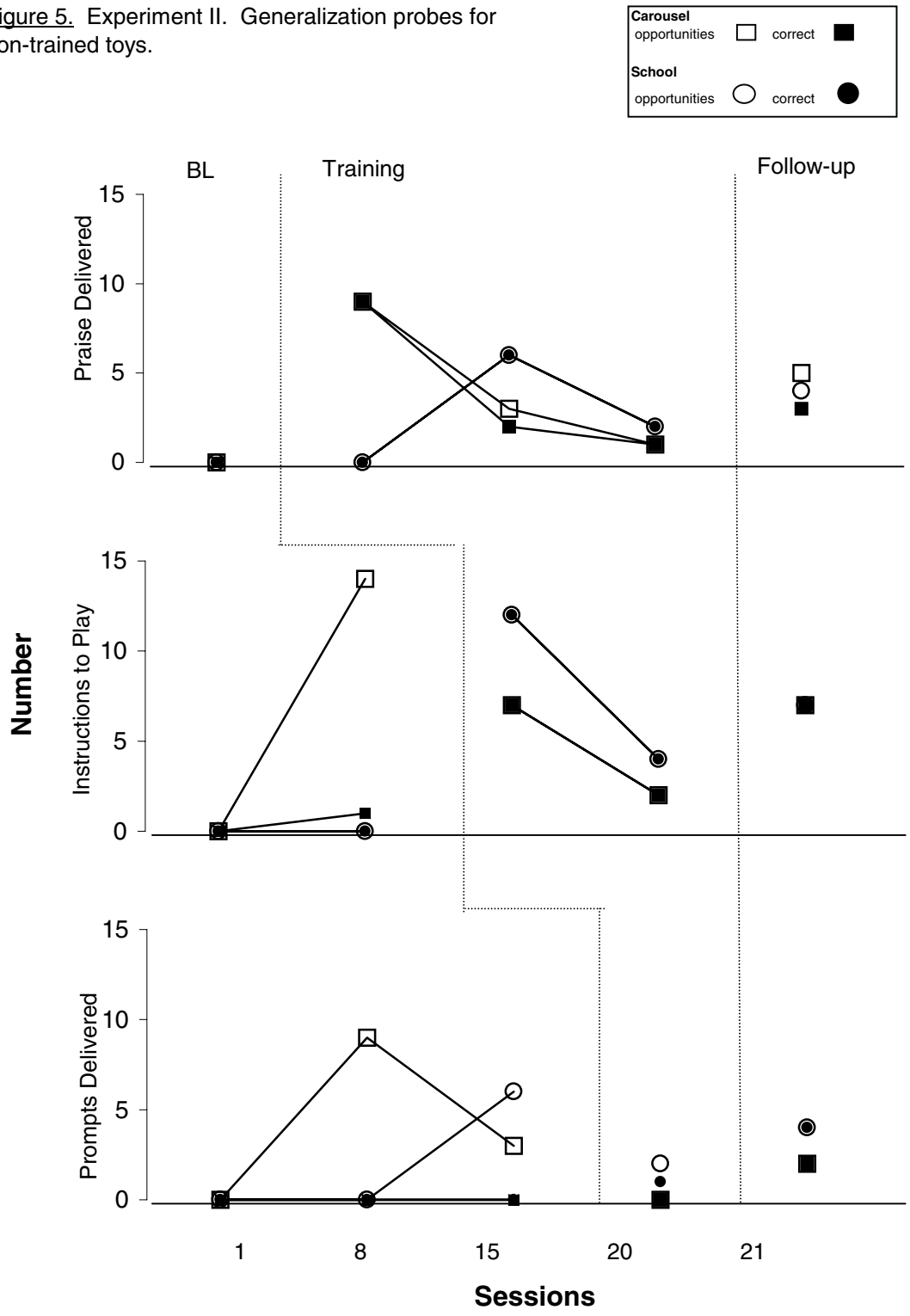


Figure 6. Experiment II. Interaction and proximity between siblings for all settings and materials.

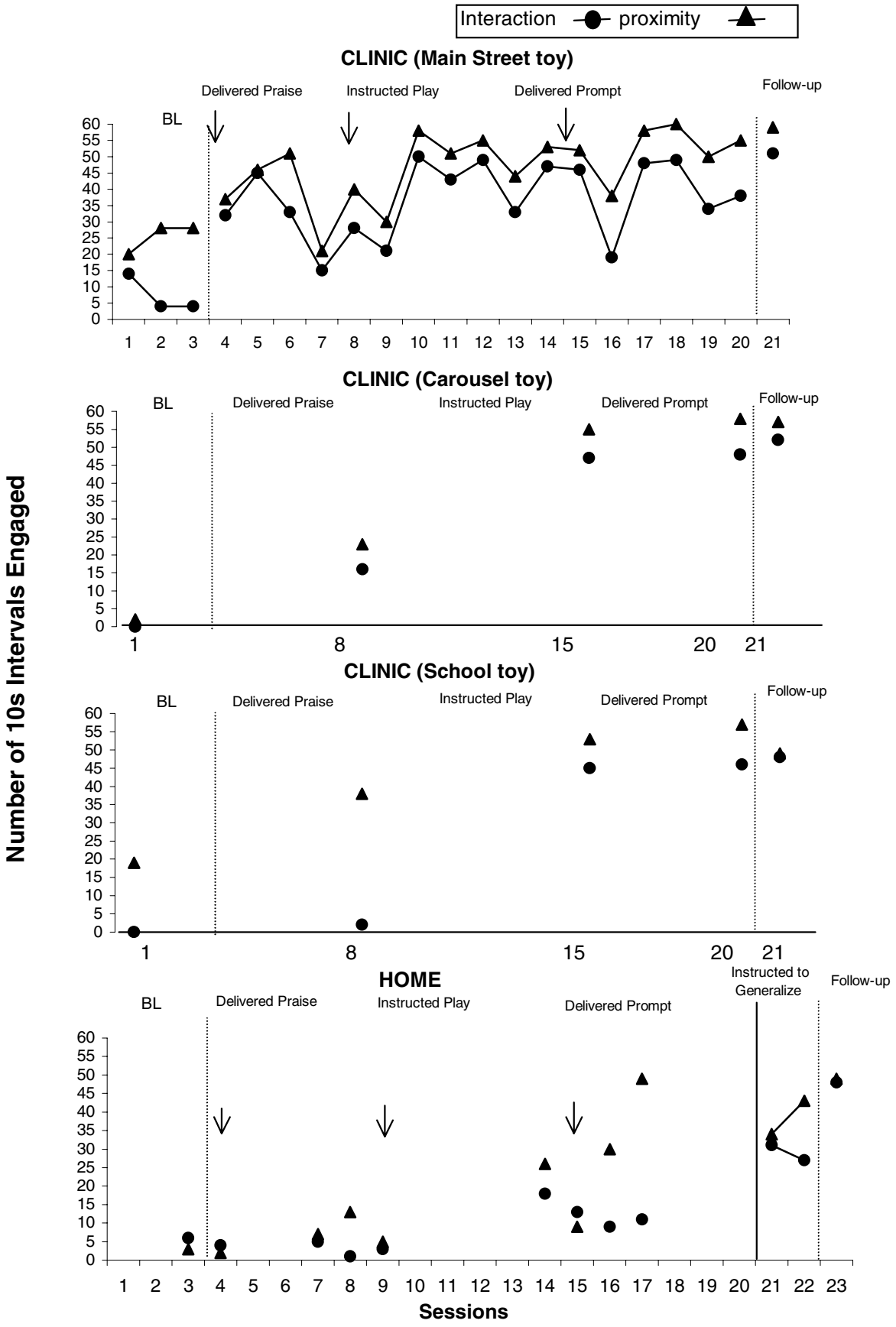
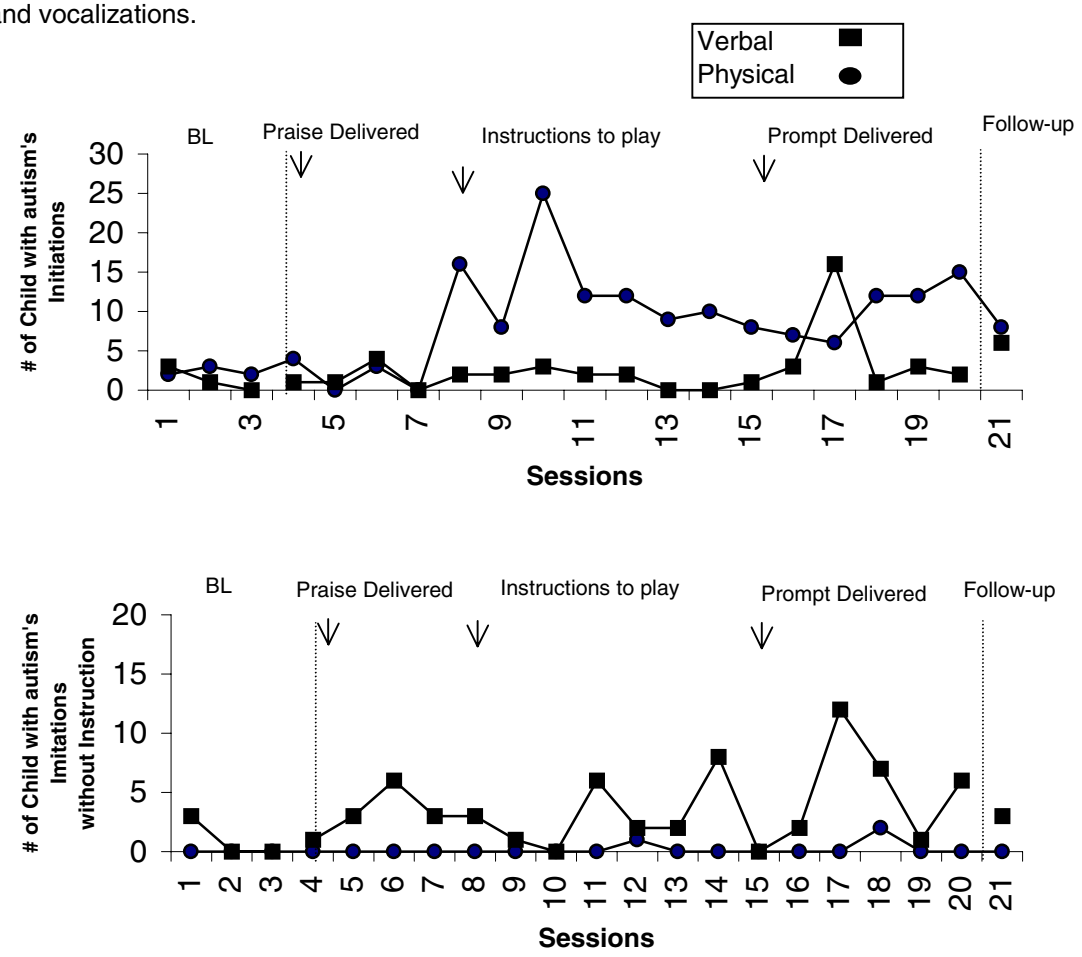


Figure 7. Experiment II. Child with autism initiations and imitation of sibling for play actions and vocalizations.



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